Water

Introduction

Water is one of California's most precious resources, serving a multitude of needs, including drinking, recreation, supporting aquatic life and habitat, and agricultural and industrial uses. It provides an essential lifeline for the state's burgeoning population of approximately 35 million. The management, assessment, and protection of California's water for all beneficial uses are of paramount concern for all of California's inhabitants.

To meet this challenge, California's water resources are addressed by an array of different agencies. Each agency approaches water resources from a unique perspective, based on its individual mandate. In a cooperative effort, the various agencies work toward managing and protecting California's surface water and groundwater resources for its many uses for the benefit of present and future generations. Such uses include drinking and other household uses, crop irrigation, industrial and recreational uses, and fish and wildlife habitat. The water indicators presented in this section are organized based on the many beneficial uses of California's water resources. In addition, indicators are also included that pertain to the specific threats to water resources, such as leaking underground fuel tanks (LUFTs). As water is closely related to many environmental issues, additional environmental indicators related to water resources may be found in other sections of this chapter (Ecosystem Health, Pesticides, Transboundary Issues, and Land, Waste and Materials Management).

Drinking Water Quality

Drinking water is highly regulated. Federal and state laws require that municipal drinking water sources be monitored regularly for a number of chemical, radiological and bacteriological contaminants and conform to standards, called maximum contaminant levels (MCLs), that provide for protection of public health. From time to time, these standards may be revised as needed, such as to reflect

Water Indicators

Water quality

Multiple beneficial uses

Aquatic life and swimming uses assessed in 2000 (Type I)

Spill/Release episodes – Waters (Type I)

Leaking underground fuel tank (LUFT) sites[1] (Type I)

Groundwater contaminant plumes – Extent[1] (Type II)

Contaminant release sites[1] (Type II)

Drinking water

Drinking water supplies exceeding maximum contaminant levels (MCLs) (Index)

Recreation

Coastal beach availability – Extent of coastal beaches posted or closed (Type I)

Fish and shellfish

Bacterial concentrations in commercial shellfish growing waters (Type I)

Fish consumption advisories – Coastal waters (Type I)

Fish consumption advisories – Inland waters (Type III)

Water supply and use

Statewide water use and per capita consumption (Type I)

Water use efficiency – Recycling municipal wastewater (Type I)

Groundwater supply reliability (Type III)

[1] Primary beneficial use affected is drinking water but others may apply.

changes in the state of knowledge regarding the health effects of contaminants. Also, the addition of new substances to the list of regulated contaminants occurs when necessary.

Overall, conformity with drinking water standards is very good and the quality of statewide municipal drinking water is high. The monitoring of public drinking water systems provides information that can be used as environmental indicators for specific chemicals and chemical types.

Surface Water Quality

Rivers, lakes, estuaries, and marine waters that are fishable, swimmable, and that support healthy ecosystems and other beneficial uses are vital to California. Environmental indicators for surface waters have been drawn from water quality assessments. The state periodically publishes a water quality assessment that lists surface waters and their conditions. These assessments provide the basis for listing of surface waters under federal requirements, such as Clean Water Act sections 303(d) and 305(b), and provide context and characterization of the extent of surface water quality conditions in the state.

While actual water quality conditions may remain static in a water body, its assessed condition may change due to new standards. Advances in the understanding of the impacts of pollutants on human health and the environment, as well as improvements in assessment technology and monitoring, may result in changes in the standards of assessment. Thus, assessments may not always be conducted in a consistent fashion over time. Accordingly, care should be exercised in drawing conclusions from surface water quality indicators presented in this section.

The indicators here reflect the safety of human consumption of aquatic life, and thus are closely linked to the quality of surface water. Excessive levels of chemical contaminants in surface water bodies may accumulate in fish to levels that make them unsafe to eat. Historical studies and ongoing monitoring have been used to perform risk assessments and issue appropriate fish consumption advisories. Fish consumption advisories describe what quantity of fish from a specified area a person can safely consume over a specified period of time without posing a significant threat to their health.

Impairments of beneficial uses often occur over long periods of time and can require years to correct. To provide shorter-term indicators of trends in water quality, episodes related to spills and beach closures and postings are included. Even in the case where a beneficial use remains impaired from year to year, trends in water quality will be apparent in the number of annual pollution episodes provided by these indicators.

Groundwater Quality

Groundwater basins supply nearly 40 percent of the water Californians use. The assessment of groundwater resources is particularly challenging due to the fact that the nature of subsurface hydrogeology is highly variable. Thus, a comprehensive statewide environmental indicator for groundwater is not currently available. Currently, environmental indicators for groundwater are based on data available for points of groundwater extraction and specific threats to groundwater resources. Threats to groundwater result from a variety of sources including leaking landfills, leaking underground fuel tanks, and other unauthorized releases of contaminants to groundwater. Additionally, in the state's agricultural industry, fertilizers and pesticide use have created elevated nitrate and pesticide levels in groundwater. Left unchecked, these contaminant releases can grow to be extensive groundwater plumes that affect the beneficial uses of groundwater, including drinking water supplies. Furthermore, once groundwater quality has been degraded, it is often very difficult and costly to clean up. Consequently, many drinking water wells have been shut down due to unacceptable concentrations of contaminants.

Although associated primarily with urban areas, municipal drinking water wells exist throughout the state and are subject to continuous monitoring. Similarly, contaminant release sites are under close supervision and monitoring. While these groundwater-related indicators do not provide a full accounting of the general status and trends of the state's groundwater resources, they are currently the best sources of data.

Water Supply

With California's ever-growing population, it is vitally important that we ensure the efficient use of our natural resources, including our water supply. In addition, California is subject to a wide range of hydrologic conditions and, therefore, experiences annual variability in its water supplies. Thus, knowledge of water supplies and water use under a range of hydrologic conditions is necessary to evaluate the needs that water managers must meet. Furthermore, uses and changes in demands for the state's water resources affect the quantity and quality of water available for all beneficial uses. Accordingly, this section presents environmental indicators relevant to water supply, to complement those that focus on water quality.

Issue 1: Water Quality (by beneficial uses)

Sub-issue 1.1: Multiple uses

California's water resources provide many different benefits to the people of the state. These beneficial uses include domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; preservation and enhancement of fish, wildlife, and other aquatic resources or preserves; and many others. Several of these beneficial uses, such as municipal drinking water, are discussed in detail in other sub-issues. Those beneficial uses not separately highlighted in other sub-issues are discussed below.

Also included in this section are the various threats to the beneficial uses of water resources. Pollutants can impact water resources from a variety of sources and via numerous pathways. These sources of pollution affect the beneficial uses of both surface water and groundwater and may include sewerage system overflows, pipeline spills, and other unauthorized discharges such as leaking underground fuel tanks and leaking landfills. Pollution may also result from historical waste management practices and agricultural activities. The number and size of such situations, and the progress of clean up efforts, indicate the amount of water resources damaged. In many cases, these sources of pollution may impact or threaten to impact drinking water supplies. The proximity of such incidents to drinking water sources indicates the potential threat to drinking water, both in terms of reduced water availability and/or additional water treatment costs.

Indicators

Aquatic life and swimming uses assessed in 2000 (Type I)

Spill/Release episodes - Waters (Type I)

Leaking underground fuel tank (LUFT) sites (Type I)

Groundwater contaminant plumes - Extent (Type II)

Contaminant release sites (Type II)

Beneficial uses

Aquatic life and habitat protection

California has over 10,000 lakes, reservoirs and ponds, over 64,000 miles of perennial rivers and streams, and over 1,600 miles of shoreline, all of which support an exceptionally rich flora and fauna. The biological diversity of these inland and marine water bodies plays an important role in the function of the various biological communities and ecosystems. Changes in aquatic environments, including water quality degradation and other environmental stresses such as competition from nonnative species, can have negative consequences on biological diversity and the maintenance of endemic populations.

In addition, the maintenance of physical habitats in aquatic environments is fundamental to the goal of preservation of aquatic communities and populations. Maintenance of particular flow regimes, substrate types, temperature regimes, types of canopy cover, and other physical habitat parameters have substantial effects on the biological resources in and around inland and marine ecosystems. Water quantity issues often arise as competing interests seek to secure water supplies for specific uses, which may lead to stresses being applied to various biological or ecological assemblages. Furthermore, aquatic habitats may also be adversely affected by the degradation of water quality (e.g., temperature increases, decreases in dissolved oxygen concentrations, nutrient and organic loads, and concentrations of various chemicals and suspended solids) resulting from human activities.

Agricultural and industrial water quality

Water resources are vital to agricultural uses, including farming, horticulture, and ranching. The accumulation of salts and trace elements in all waters used for agricultural purposes can have a profound influence on productivity.

Uses of water for industrial activities include cooling water supply, hydraulic conveyance, fire protection, and consumptive uses in making products and cleaning of parts and goods. Water quality requirements differ widely for the many industrial processes in use today. In large part, protection of industrial and agricultural uses of water occurs with protection of more vulnerable uses, such as drinking water and aquatic life.

Aesthetic conditions

Aesthetic acceptability of marine and inland surface waters varies widely depending on the nature of the supply source to which people have become accustomed. However, the parameters of general concern are excessive hardness, unpleasant odor or taste, turbidity, and color. In addition, excessive weed and algae growth, and litter and trash accumulation are significant concerns.

Sub-issue 1.2: Drinking water

One of the most significant beneficial uses of water is for drinking water supplies. Drinking water, whether from groundwater or surface water sources, represents a potential pathway for human exposure to pollution. In practice, because public water systems are constrained by regulation from serving water that exceeds standards (maximum contaminant levels, MCLs), the actual exposure to polluted drinking water may be reduced or eliminated altogether by treating the water prior to service or by taking the source out of service. The indicators developed for this section pertain to MCL exceedances in drinking water sources at the point of entering the drinking water supplies. While the regulation of public drinking water systems is intended to protect the drinking water of most consumers, some consumers rely on smaller unregulated water supply systems.

Contaminants that have been found in drinking water sources include those listed below:

Inorganic:

This general category contains primarily minerals that are naturally occurring, although some, such as arsenic and chromium, may also have industrial or commercial application. It also includes additional substances, such as nitrates, cyanide and perchlorate.

Organics:

This general category contains primarily chemicals that are synthetic and used in industry or commercially. A number of chemicals in this category are byproducts of water treatment (i.e., chlorination). This category does not include pesticides.

Pesticides:

This general category contains primarily pesticides that are or have been used in agriculture.

Radioactivity:

This general category contains primarily radioactivity that is naturally occurring, although strontium-90 is a fission product and a component of historic global fallout from above ground nuclear weapons tests. The category includes general measurements of radioactivity such as gross alpha particles and gross beta particles, and it also includes specific standards for uranium, two radium isotopes, and others.

Indicator

Drinking water supplies exceeding maximum contaminant levels
(Index, Type I)

Indicator

Coastal beach availability – Extent of coastal beaches posted or closed (Type I)

Sub-issue 1.3: Recreation

Beaches are one of California's most valued natural assets. California has over 1,600 miles of shoreline, with the majority of swimming beaches located in southern California. In addition, California has over 10,000 lakes, reservoirs, and ponds and over 64,000 miles of perennial rivers and streams. Many of these freshwater bodies are used seasonally for swimming. Beaches, or more precisely the waters adjacent to the beach, must be safe for swimming and other recreational uses to protect public health. Clean beaches are also important to the local economy that depends on tourism and local visitation and the quality of life for Californians who value being able to visit and swim at the beach. Due to events such as sewerage system spills and polluted urban runoff, certain bacteria may be present in beach waters at concentrations that may pose a threat to public health. In these cases, local health officers close or post beaches to protect public health. Recent laws require more uniform and consistent monitoring and posting/closure decisions by counties to reduce health risks and increase the public's access to beaches.

Indicators

Bacterial concentration in commercial shellfish growing waters (Type I)

Fish consumption advisories – Coastal waters (Type I)

Fish consumption advisories – Inland waters (Type III)

Sub-issue 1.4: Fish and Shellfish Consumption

Uses of water for commercial or recreational collection of fish, shellfish, or other organisms in oceans, bays, and estuaries, including uses involving organisms intended for human consumption or bait purposes, are important to California. To protect this beneficial use, the aquatic habitats where these organisms reproduce and seek their food must be protected. Decreased surface water quality can result in potential human exposures to toxic substances through consumption of contaminated fish and shellfish.

Health advisories are issued when the levels of toxic chemicals in sport fish tissue are deemed to present a potential threat to human health. Similarly, elevated bacterial concentrations in shellfish growing waters can result in potential human exposures to pathogens through consumption of contaminated shellfish.

Issue 2: Water Supply and Use

Managing water supplies to ensure that demands from the various uses are met is a major challenge for California. The Department of Water Resources has addressed water supply and use since 1957, with the issuance of Bulletin 3, the California Water Plan. The California Water Plan is updated by the Bulletin 160 series (published six times between 1966 and 1998) which assesses California's agricultural, environmental, and urban water needs and evaluates water supplies to meet demand. The Bulletin 160 series presents a statewide overview of current water management activities and provides managers with a framework for water resources decisions.

During drought years, groundwater supplies are used to a greater degree than in non-drought years. To meet the water demands during drought years requires an understanding of available groundwater supplies.

One method of increasing water use efficiency is to recycle water for various uses. Municipal wastewater, collected and treated, can be directly used for a variety of beneficial uses, depending on the quality of the effluent. These uses include agricultural and landscape irrigation, industrial cooling water, recreation, and wildlife habitat.

Indicators

Statewide water use and per capita consumption (Type I)

Water use efficiency – Recycling municipal wastewater (Type I)

Groundwater supply reliability (Type III)

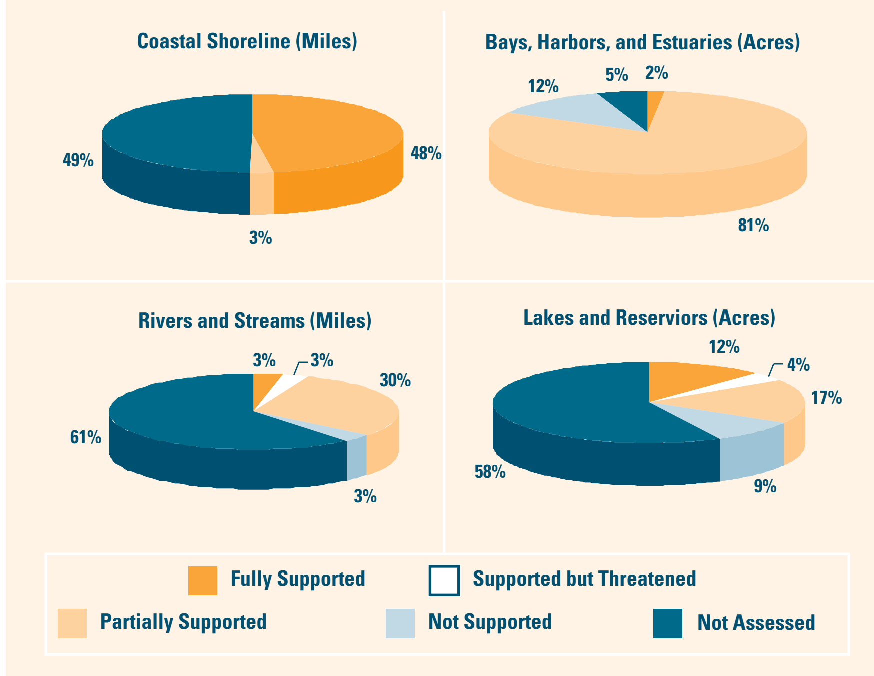
Type I

Level 4
Goal 2

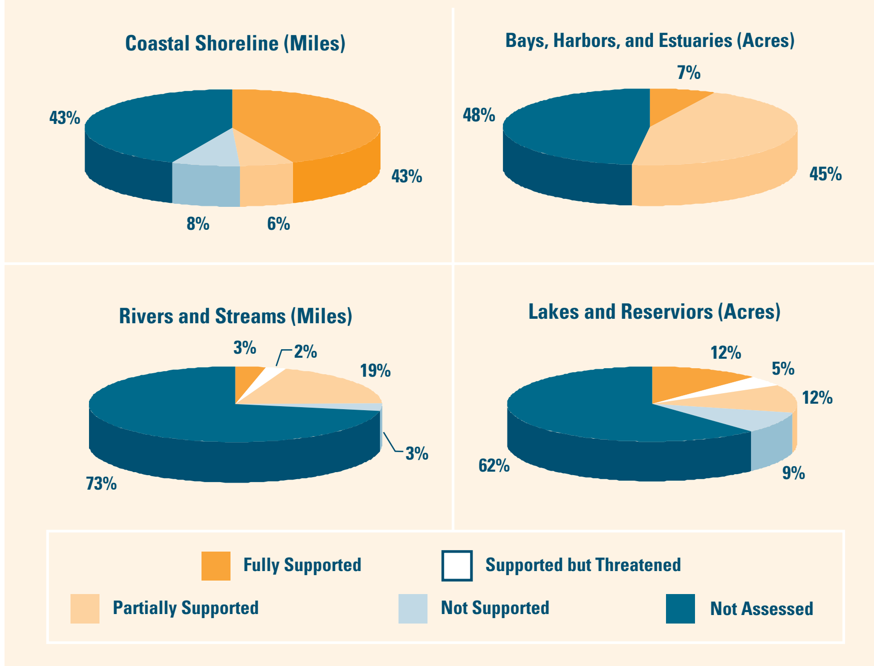
Aquatic Life and Swimming Uses Assessed in 2000

Limited water quality information is available to assess status.

Percent of Water Bodies Supporting Aquatic Life



Percent of Water Bodies Supporting Swimming



What is the indicator showing?

These figures show the percentage of California's water bodies where two major beneficial uses (aquatic life and swimming) are supported, threatened, partially supported, and not supported for the year 2000. The quality of the data used and the lack of a comprehensive effort to assess these waters limit the interpretation of this assessment. A large percentage of the state's waters have not been assessed.

Why is this indicator important?

The spatial extent of surface water beneficial use support represents an integrated view of the quality of surface water resources. Every two years, the State Water Resources Control Board (SWRCB) develops a Water Quality Assessment (WQA) report pursuant to the federal Clean Water Act that provides an assessment of the status of the waters of the state [see State Water Control Board, *2000 California 305(b) Report on Water Quality*]. The report presents estimates of the area of water bodies and the linear miles of rivers and streams that either support or do not support beneficial uses.

Water quality programs are designed and implemented to concurrently protect all beneficial uses of water including aquatic life, habitat, aesthetic condition, consumption of aquatic organisms, drinking water, and recreation. For the year 2000, this indicator provides the status of aquatic life protection and swimming.

The indicator is presented as the percentage of the state's water body types (e.g., ocean, rivers and streams, lakes and reservoirs, estuaries, enclosed bays, and harbors) that are fully supported, supported but threatened, partially supported, not supported, or of unknown status (the area or linear miles yet to be monitored and assessed). At present, the data needed to perform a comprehensive assessment of all state waters are not available.

What factors influence this indicator?

The major influences on this indicator are the inconsistent approaches used in developing the WQA and the very limited monitoring data for some water body types used in previous assessments. The SWRCB and Regional Water Quality Control Boards (RWQCBs) have not used consistent guidelines in establishing the status of water bodies. At present the information in the WQA cannot be used to make year-to-year comparisons.

The state is addressing this deficiency by the implementation of a new comprehensive Surface Water Ambient Monitoring Program (SWAMP). SWAMP is focused on providing the information to assess all waters of the state and to provide the SWRCB and RWQCBs with the information needed to protect the state's water quality effectively. This new program is designed to provide information on all waters of the state without bias to known impairment. The monitoring program will use consistent sampling and analysis methods. SWAMP will also be: adaptable to changing circumstances, built on cooperative efforts, established to meet clear monitoring objectives, inclusive of already available information, and implemented using scientifically sound monitoring design with meaningful measurements of water quality.

Technical Considerations:

Data Characteristics

The SWRCB reports every two years on the status of individual beneficial use support for a variety of water body types including bays and harbors, coastal shoreline, estuaries, groundwater, lakes and reservoirs, rivers and streams, saline lakes, and freshwater/tidal wetlands. The RWQCBs estimate the size (in acres or miles) of the water bodies that are: (1) fully supporting beneficial uses, (2) supporting but threatened, (3) partially supporting, (4) not supporting, (5) not attainable, and (6) not assessed. For the purposes of the EPIC analysis, percentages were developed based on total miles in the case of perennial streams, perennial rivers, and coastline; and total acres in the case of harbors, bays, estuaries, lakes, and reservoirs.

In developing the state's WQA, the SWRCB and RWQCB use the U.S. Environmental Protection Agency guidance describing the beneficial use support categories. These categories are described below:

1. "Fully Supporting" refers to water of good quality. "Good" waters support and enhance the designated beneficial use.

2. "Fully Supporting But Threatened" refers to those waters of good quality where the beneficial use shows a declining trend in water quality over time.

3. "Partially Supporting" refers to all intermediate and less severely impaired waters. "Intermediate" waters support the beneficial use with an occasional degradation of water quality. The term "intermediate" usually indicates suspected impacts to the beneficial use, i.e., a problem is indicated but inadequate data are available. ""Impaired" water bodies cannot reasonably be expected to attain or maintain applicable water quality standards, and the beneficial use shows some degree of impairment.

4. "Not Supporting" refers to those water bodies in which the beneficial use is severely impaired and which staff judges to merit serious attention.

A variety of data types are used in making the assessments. A sample of the data types used to develop the WQA Report is presented below:

1. *Aquatic life:* biological assemblages, habitat assessment, toxicity testing, and physical/chemical measurements.

2. *Swimming:* bathing area closures or posting data, bacteriological indicator densities, enteric virus densities, etc.

Strengths and Limitations of the Data

Strengths: The SWRCB and RWQCBs have reported water quality conditions in the Water Quality Assessment (WQA) reports for 25 years. These reports provide a general estimate of the degree and scope to which beneficial uses of state waters have been supported or not supported.

Limitations: RWQCB staff uses a significant amount of professional judgement in preparing the WQA. Over the years the criteria used to evaluate data have varied and, consequently, year-to-year comparisons are difficult to make at present. The indicator is probably more influenced by changes in the approach for completing the assessment and the availability of monitoring data than actual improvement or degradation of water quality.

The figures presented above should be interpreted with caution because the analysis reflects a non-statistical assessment of the state's waters using data collected at mostly problem sites.

With this limited and biased information, it is not possible to tell if water quality statewide has improved or degraded until we have (1) improved our data collection and analysis approaches and (2) assessed a greater percentage of the state's waters. Also, since most of the information used in the WQA is collected in response to suspected problems, clean waters are less likely than waters with suspected problems to be targeted for monitoring. Little if any of these data were collected using a probability-based sampling design and, therefore, the WQA areal assessments do not have a statistical basis.

References:

State Water Resources Control Board. *2000 California 305(b) Report on Water Quality.*

State Water Resources Control Board. *Proposal for comprehensive surface water quality monitoring program.* November 2000. Posted at: www.swrcb.ca.gov/ab982/html/swamp.html

For more information, contact:

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Type I

Level 3
Goal 2, 4

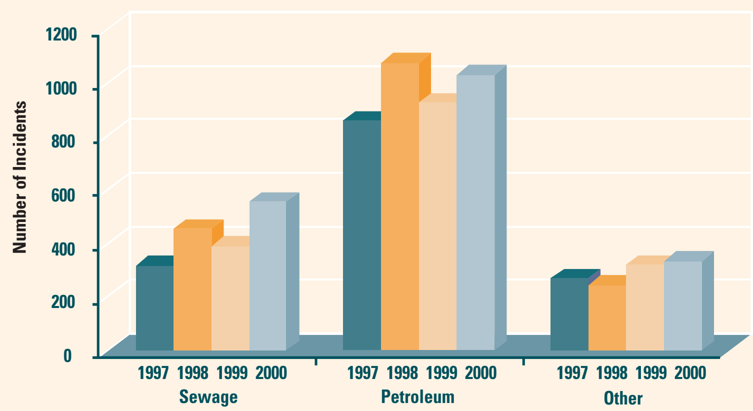
Spill/Release Episodes - Waters

There are more instances of sewage, petroleum and other materials/wastes spilled to waters.

What is the indicator showing?

From 1997 to 2000, spills to waters reported to the Office of Emergency Services have increased approximately 33 percent. The number of sewage spills increased 76 percent. In general, these spills have caused temporary conditions of pollution or nuisance.

Reports of Spills to Waters Received by the Office of Emergency Services



Why is this indicator important?

Spills of wastes and materials affect public health and the environment. This Spill/Release Episodes to Waters indicator tracks the number of reports of spills to waters received by the Governor's Office of Emergency Services (OES) each year.

This indicator shows the number of times each year that uses of waters are threatened or polluted by spills and releases. It also indirectly indicates the level of pollution prevention practices attendant with the handling of municipal sewage, petroleum products and other materials/wastes.

What factors influence this indicator?

OES receives reports of spills from regulated dischargers and the public. In turn, OES advises the Regional Water Quality Control Boards of such instances. Regional Water Quality Control Boards respond to reports of spill incidents that pose a threat to waters of the state. Such spills usually have a short-term effect, causing temporary conditions of pollution and/or nuisance. Typically, temporary conditions of pollution/nuisance are not reflected in the state's periodic assessment of water quality conditions. However, some short-term effects such as a temporary closure of a beach, a temporary shutdown of a drinking water intake, or a fish kill, are accounted for in the coastal beach mile-days indicator and fish advisory indicator. Long-term effects can occur when large quantities or extremely hazardous materials are spilled. When long-term effects are apparent, the water body is a candidate for listing as an impaired water body (see Aquatic Life and Swimming Uses Assessed in 2000 Indicator). In some cases, effects of spills may not be observable or measurable.

Not all reports of spills to OES accurately portray the actual threat to waters; spill volumes and the vicinity of surface and groundwaters are often estimates. Thus, reports may overstate the threat of some situations and understate others. However, OES data provide a good measure to observe annual trends in spill-related episodes.

Technical Considerations:

Data Characteristics

Data have been summarized from OES databases for sewage, petroleum spills to waterways and spills to all waters.

Strengths and Limitations of the Data

The reports include all calls made to the OES Warning Center. The calls are not verified in this database and may include calls which do not affect waters. In addition, all reports to OES are included, regardless of the extent of the threat to public health or the environment.

Reference:

Governor's Office of Emergency Services, Hazardous Materials Spill Database.

For more information, contact:

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Type I

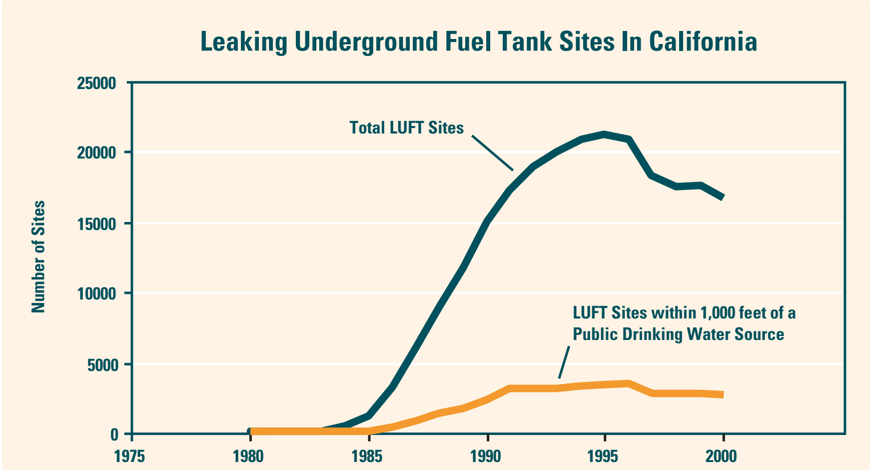
Level 3
Goal 3

What is the indicator showing?

Trends are shown for the total number of leaking underground fuel tank (LUFT) sites and those LUFT sites within 1,000 feet of public drinking water sources over a 21-year period. Between 1985 and 1995, the number of LUFT sites increased significantly, likely due to increased monitoring. This trend peaked in 1995 and is now steadily decreasing.

Leaking Underground Fuel Tank (LUFT) Sites

Statewide numbers of LUFT sites are declining.



Why is this indicator important?

Leaking underground fuel tanks (LUFTs) can act as 'point sources' for shallow groundwater contamination. Depending on the amount of fuel released, the chemical characteristics of the fuel released, the hydrogeologic properties of the aquifer impacted by the release, and the locations of public drinking water sources in relation to the LUFT sites, public water supplies can be threatened or directly impacted. For water quality management purposes, a greater number of fuel releases within a given proximity to a public water supply may indicate a greater potential threat to the water supply.

The first indicator, total LUFT sites, is a broad measure of the status of our efforts to reduce the overall threat of this type of release to groundwater resources. Total LUFT sites is the total number of underground storage tank sites that have been found to be leaking and for which cleanup has not been completed. The second indicator, those LUFT sites located within 1,000 feet of public drinking water sources, is also a measure of our success at protecting groundwater quality and identifies the relative proportion of LUFT sites that may be an imminent threat to drinking water supplies.

What factors influence this indicator?

Currently, the total number of underground fuel tank sites is approximately 38,000. Of that 38,000, approximately 17,000 are identified as LUFT sites. The graph above indicates an increasing trend in LUFT sites between the years 1985 and 1995. The 1985 date represents the general period during which underground tank regulatory programs expanded at both the state and local government levels. Increased regulatory attention resulted in better accounting of the problem. The 1998 federal deadline for upgrading underground fuel tanks to current construction and monitoring standards is also a factor that likely contributed to the earlier increasing trend, as many tank owners discovered that their tanks had leaked during the upgrade activities. The sharp decrease in the number of total LUFT sites in approximately 1996 may correlate with the findings of studies that demonstrated that in most cases where the source of contamination has been removed, groundwater plumes of petroleum hydrocarbon constituents have not migrated great distances from the source due to attenuation processes (including biological degradation) acting on the contaminants. Based on these findings, many agencies closed numerous cases where the remaining contamination was stable and did not pose a threat to human health. Currently, with nearly all active tanks having been upgraded, the total number of LUFT sites should continue to decline.

With respect to the indicator involving proximity of underground tanks to public drinking water sources, the density of underground fuel tanks and public supply water wells closely correlates with areas of population densities. Addressing these sites is a high priority and an efficient evaluation may be conducted using the SWRCB's new environmental database, GeoTracker.

GeoTracker is a geographic information system (GIS) that provides online access to environmental data. GeoTracker is the interface to the Geographic Environmental Information Management System (GEIMS), a data warehouse which tracks regulatory data about underground fuel tanks, fuel pipelines, and public drinking water supplies. The centralization of environmental data through GeoTracker will facilitate more in-depth geospatial and statistical analysis in the future. This expansion in capabilities will greatly assist public agencies in planning and resource management.

Technical Considerations:

Data Characteristics

The data supporting these indicators are readily available on the GeoTracker database and have been collected as part of the Underground Storage Tank (UST) Program since 1980. Data supporting these indicators for LUFT sites in the Department of Defense program will be available in the 2001-2002 Fiscal Year. The spatial extent of groundwater plumes associated with this type of release is also captured in the "Groundwater Contaminant Plumes - Extent" environmental indicator.

Strengths and Limitations of the Data

GeoTracker uses commercially available software to allow users to access data from the Internet. The readily accessible database results in less duplication of effort and improved communication between stakeholders. The GeoTracker database is routinely updated and verified. Thus, the associated data are generally considered of good quality.

An accurate count of LUFT sites in a specific year requires knowledge of the site discovery date. In some cases (4000 records), the discovery date is unknown. In addition, the measurement of proximity of LUFT sites to water supply sources requires accurate data on locations of both the tanks and supply wells. Currently, the public water wells and LUFT positions are approximate. Locational accuracy is improving as state agencies and responsible parties obtain and report new and better information to the GeoTracker database.

For more information on the State Water Resources Control Board's Underground Storage Tank Program, please visit http://www.swrcb.ca.gov/cwphome/ust.

References:

GeoTracker: http://geotracker2.arsenaultlegg.com/

For more information, contact:

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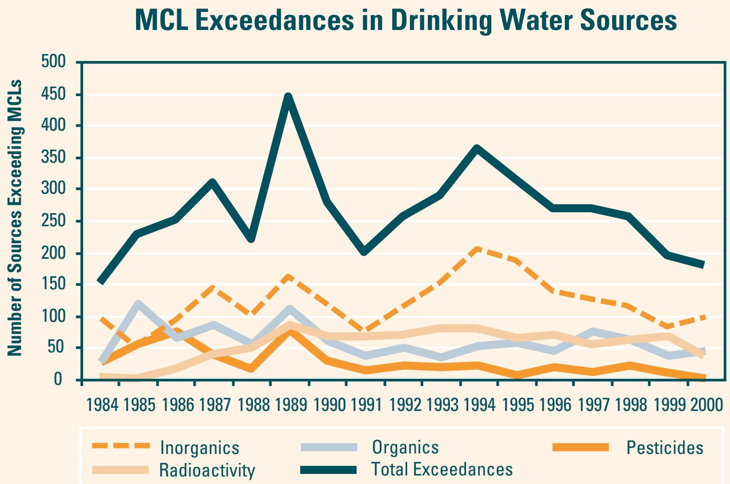
Drinking Water Supplies Exceeding Maximum Contaminant Levels (MCLS)

There is a slight decline in the overall low numbers of MCL exceedances in public drinking water sources.

Type I

Level 4
Goal 2, 3



What is this indicator showing?

Statewide monitoring of about 20,000 public water supply wells and surface water sources shows a slight decline in the overall low numbers of sources contaminated by naturally occurring and man-made substances.

Why is this indicator important?

This indicator shows the presence of regulated drinking water contaminants in wells and surface water sources belonging to public drinking water systems. It should not be considered a human health indicator since it is not an index of human exposure, because regulatory steps are taken to eliminate or minimize human exposure to drinking supplies with contaminants that exceed drinking water standards (called maximum contaminant levels or MCLs).

Public health agencies are concerned about contaminants in drinking water, particularly those that may affect the very young, or those that may cause reproductive effects, cancer, or other adverse effects. To protect the public health, the California Department of Health Services (DHS) has established MCLs, which are health-protective limits for a number of such contaminants in drinking water.

MCLs protect water consumers from adverse health effects associated with ingestion of 78 chemical contaminants and 6 radiological contaminants. Some of these contaminants may be naturally occurring, and some are the result of human activities.

Public water systems are required to routinely monitor their drinking water supplies on a regular basis for these contaminants. Additional standards and monitoring requirements exist for disinfection byproducts (the contaminants that are produced when water is treated by chlorination to remove microbiogical organisms, for example) and for lead and copper. Monitoring is also required for specific unregulated chemicals (currently nine are identified in DHS regulations); this enables DHS to collect information on the extent of their presence. Finally, when water systems' monitoring shows the presence of other unregulated contaminants, they must inform DHS of their findings. Such findings may result in the establishment of non-regulatory health-based advisory action levels, or in additional monitoring requirements. For some "new" contaminants, DHS may adopt regulations requiring monitoring, and in some cases, may adopt a new MCL. This is the process that was followed for the gasoline additive, methyl tertiary butyl ether (MTBE).

The monitoring that is conducted for purposes of complying with drinking water standards, whether from groundwater or surface water sources, allows for an evaluation of pollutants from contaminating activities or from natural sources, and elimination of potential pathways for human exposure to these contaminants. Monitoring also results in a body of data that can be examined as indicators of environmental pollution. In most cases, for example, for organic chemical contaminants pursuant to California regulations, monitoring occurs prior to any water treatment, though if treatment for a specific contaminant is required, monitoring occurs thereafter. Some chemicals are clearly related to treatment and are monitored after treatment, such as fluoride, where fluoridation occurs, and such as disinfection byproducts, which may result from chlorination.

The indicators presented here show contaminants in sources of drinking water supplies. They should not be viewed as contaminants that people have been drinking in their water. In practice, because public water systems may not serve water that exceeds health-based MCLs, except under rare conditions, the actual exposure to polluted drinking water may be reduced or eliminated by treating the water prior to service or by taking the source out of service.

For purposes of discussion, the various types of contaminants of concern to drinking water have been divided into four general categories: inorganic chemicals, organic chemicals, pesticides, and radioactivity.

What factors influence this indicator?

Contaminants in drinking water represent the environment from which the water is sampled. For example, contaminants such as arsenic, chromium, and radioactivity can reflect the geology of the area from which the water is drawn.

Drinking water well contamination can also result from contamination of soils and groundwater by human activities, including industry (e.g., trichloroethylene (TCE), a solvent used in the aerospace industry), commercial businesses (e.g., tetrachloroethylene (perchloroethylene, or PCE), a solvent used in dry cleaners), agriculture (e.g., 1,2-dibromo-3-chloropropane (DBCP), used in soil fumigation), and fuels (e.g., the gasoline additive MTBE, from leaking underground storage tanks). Surface water contamination can also result from chemical use (e.g., MTBE, from motorized boats and watercraft, or from gasoline spills from tanks or marine fueling stations).

Prevention of soil and groundwater contamination can be a very significant factor in preventing contamination of drinking water supplies. So, too, can prevention of contamination that may reach surface waters.

The sampling requirements can also influence these indicators. Over the past two decades, the number of regulated contaminants has increased markedly. This results in increased monitoring by public water systems. Similarly, monitoring requirements for unregulated chemicals (those without MCLs) have also resulted in more information being collected, and in some cases, new MCLs. Finally, improvements in laboratory analytical methods have made it possible to detect contaminants at lower levels — this may increase the number chemical detections. Such changes to the monitoring of public water supplies are anticipated to continue in the future.

The monitoring of water supplies by drinking water systems demonstrates that exceedances of MCLs on a statewide basis are relatively uncommon. However, even though statewide drinking water quality is good, on a localized basis, when an exceedance of an MCL occurs, it can be a very significant occurrence. If treatment is required, it may be expensive to the water system and to its customers. If treatment is not feasible, then the source of water may be lost to the community.

As mentioned above, drinking water MCL exceedances should not be interpreted as reflecting water being served, since wells may be treated or taken out of service, with no human exposure occurring. If such water is served, consumer notification is required.

The data show a slight decrease in the total MCL exceedances over the sampling period. Some improvements are apparent among organic and pesticide contaminants, likely reflecting improvements in industrial and agricultural practices that resulted in contamination several decades ago. MCL exceedances for inorganics and radioactive contaminants are flat, or even increasing, most likely influenced by changes in regulatory standards and monitoring requirements over the time period.

Exceedances by County

As of December 2000, the number of drinking water sources in the DHS database was over 25,000, with more than 20,000 sources identified as active and delivering water for public consumption. Of the state's 58 counties, each had at least one source that exceeded an MCL. The distribution of MCL exceedances differs among counties — for example, in Los Angeles County organic contaminant MCL exceedances account for 57 percent of the total, while pesticides account for 0.8 percent, while in Fresno County, organic MCL exceedances represent 7 percent of the total and pesticides account for 50 percent. The number of exceedances also reflects the counties' number of sources that are monitored, in that a county with many wells, for example, will monitor more wells than one with few wells.

Counties with the most sources that have exceeded an MCL since 1984 are presented below:

County	MCL Exceedances in Public Water Systems (1984-2000)				
	Total	Inorganic	Organic	Pesticide	Radioactivity
Los Angeles	1,148	415	653	9	71
San Bernardino	556	293	74	46	143
Kern	458	200	46	59	153
Riverside	344	181	23	36	104
Fresno	281	61	20	141	59
Stanislaus	205	58	8	57	82
Tulare	143	66	11	46	20
Santa Clara	109	96	5	0	8
San Joaquin	106	21	20	39	26
Ventura	105	72	6	2	25
Kings	74	32	19	3	30
Orange	70	49	11	1	9
San Diego	70	23	8	1	38
Monterey	66	41	13	0	12
San Luis Obispo	63	55	4	0	4
Sacramento	51	31	16	1	3
Sonoma	51	31	8	1	11
Merced	47	11	11	20	5
Others (39 counties)	504	307	78	18	92
Total	**4,452**	**2,043**	**1,034**	**480**	**895**

These general groups-inorganic and organic chemical contaminants, pesticides, and radioactivity-are discussed individually below.

Inorganic Chemical Contaminants:

This general category primarily consists of minerals that are naturally occurring, though some, such as arsenic and chromium, may also have commercial application. It also includes nitrates, which may reflect agricultural activities such as fertilizer application and confined animal feeding operations. It also includes some other substances such as cyanide (which may result from steel/metal, plastic and fertilizer manufacturing) and unregulated inorganics such as the naturally occurring boron and perchlorate (from aerospace, fireworks, and munitions). Fluoride, which is the most frequently detected inorganic chemical, is naturally occurring, and it may also be added to drinking water in fluoridation programs.

The inorganic contaminants that have been detected most frequently are fluoride (11,917 sources), nitrate as NO_3 (9,263), arsenic (4,476), aluminum (3,213), boron (2,002), lead (1,393) and chromium (1,138).

Inorganic contaminant MCLs that have been exceeded most often are nitrate as NO_3 (964 sources), fluoride (350), aluminum (163), cadmium (119), and arsenic (128).

Organic Chemical Contaminants:

This general category contains primarily chemicals that are man-made and used in industry or commercially. This category does not include pesticides — data on pesticide MCLs are presented separately.

A number of chemicals in this category are byproducts of water treatment [i.e., chloroform (1,145 sources), bromodichloromethane (647), dibromochloromethane (619), (bromoform (602), dibromochloromethane, and dichlorodifluoromethane (119)].

The organic contaminants excluding disinfection byproducts most often detected include PCE (894 sources), TCE (808), 1,1,1-trichloroethane (195), 1,1-dichloroethylene (191), *cis*-1,2-dichloroethylene (168), 1,2-dichloroethane (119), and carbon tetrachloride (127), methylene chloride (87), MTBE (37), diethylhexylphthalate (DEHP) (29), and benzene (24).

Organic contaminant MCLs that have been exceeded most often are TCE (332 sources), PCE (271), 1,2-dichloroethane (119), carbon tetrachloride (127), 1,1-dichloroethylene (50), MTBE (23), benzene (21), *cis*-1,2-dichloroethylene (18), and DEHP (16).

Pesticide Contaminants:

This general category is primarily pesticides that are or have been used in agriculture. Several are no longer used, e.g., 1,2-dibromo-3-chloropropane (DBCP) (registration cancelled in the late 1970s), ethylene dibromide (EDB) (cancelled in the early 1980s), and 1,2-dichloropropane (cancelled in the mid-1980s).

For pesticide contaminants with MCLs, those that have been most often detected are DBCP (879 sources), EDB (77), 1,2-dichloropropane (56), atrazine (13), simazine (11), and bentazon (5).

Pesticide MCLs that have been exceeded most often are DBCP (405 sources), EDB (45), 1,2-dichloropropane (7) and simazine (1).

Radioactive Contaminants:

This general category contains radioactivity that is primarily naturally occurring in soils, and contributes to our natural background radiation exposure. One of the regulated radionuclides, strontium-90, is a fission product and a component of historic global fallout from above ground nuclear weapons tests.

Radioactive materials most often detected include gross alpha particles (8,267 sources) and gross beta particles (1,227 sources). These particles are very small emissions from certain radioactive elements, such as radium and uranium, which are alpha emitters, and tritium, which is a beta emitter. Alpha particles consist of 2 protons and 2 neutrons (i.e., a helium nucleus), while beta particles are smaller, the size of an electron.

Other detections include radon-222 (1,784), radium-226 and radium-228 combined (476), radium-226 (427), radium-228 (146), strontium-90 (55), and tritium (53).

During analyses, if the gross alpha particle MCL is exceeded, specific analyses for uranium and radium are performed. MCLs that have been exceeded most often are gross alpha particles (532 sources), uranium (243), radium-226 (48), radium-228 (47), and strontium-90 (11).

Recent Activities

As a result of new federal and state requirements, drinking water systems are required to provide an annual consumer confidence report (CCR) to their consumers. The CCR must include information about contaminants that are found in drinking water and their health significance.

To help protect drinking water supplies, DHS' Drinking Water Source Assessment and Protection (DWSAP) Program performs assessments that identify possible contaminating activities to which drinking water supplies may be vulnerable. The DWSAP Program also provides guidance and identifies potential funding sources for voluntary community-based activities to protect water supplies from future contamination.

For more information, see the DHS website at www.dhs.ca.gov/ps/ddwem/ and your drinking water system's annual Consumer Confidence Report.

Technical Considerations:

Data Characteristics

Over 873,000 initial analyses (i.e., the first analysis for a specific contaminant in a source) were performed from 1984 through 2000 by California's public drinking water systems. As of December 2000, the number of drinking water sources in the DHS database was over 25,000, with more than 20,000 sources identified as active and delivering water for public consumption.

The data presented here are in terms of first-time analyses, first-time detections and first-time MCL exceedances. Using "first-time" data eliminates the confounding of data interpretation by multiple detections and multiple MCL exceedances (since positive findings can result in more frequent sampling and therefore more detections). In some cases, raw and treated water from the same well or surface water source are in the database as separate entries.

Data for the four general categories were collected from a number of drinking water sources:

- Inorganic contaminants: Sampling occurred from 79 to 12,000 drinking water sources, depending on the particular contaminant being analyzed. The database contains positive findings for 25 different inorganic contaminants.
- Organic chemicals: 3 to15,000 drinking water sources depending on the particular contaminant being analyzed. The database contains positive findings for 50 different organic contaminants.
- Pesticides: 2,500 to 15,000 drinking water sources depending on the particular contaminant being analyzed. The database contains positive findings for 18 different pesticide contaminants.
- Radiological contaminants: 445 to 10,000 drinking water sources depending on the particular contaminant being analyzed. The database contains positive findings for 9 different radioactive contaminants.

Of the 20,000 sources identified as active and delivering water for public consumption, there are approximately 56,000 first-time detections and 4,452 first-time MCL exceedances. The overall numbers of analyses and findings are as follows:

Contaminant Type	Analyses	Detections	> MCL
Inorganic	156,838	34,427	2,043
Organic	476,164	7,224	1,034
Pesticide	221,311	1,069	480
Radioactivity	19,634	13,205	895
Total	873,947	55,925	4,452

The collection of data for regulated chemical contaminants is done according to schedules and procedures set forth in state regulations. The data are from drinking water systems that are regulated by DHS. Smaller systems that are regulated by local primacy agencies (usually county environmental health departments) have not been required to submit data to the DHS database, although regulatory changes in 2001 will result in those data being submitted to the DHS database. Additional data submissions may result in additional findings, which will not necessarily indicate an environmental change.

Private wells are not required to monitor for drinking water contaminants.

Strengths and Limitations of the Data

The body of data is dynamic, representing changes in the number of drinking water sources, changes in the contaminants for which monitoring is required, and changes in the reporting limit (related to the analytical detection limit). In addition, MCLs may be changed by regulatory action, or new MCLs may be adopted.

Because all drinking water sources are subject to repeated sampling and analyses, the data presented in this summary dealing with drinking water MCLs represent only the first time a chemical was sampled, detected, or found to exceed an MCL in a given source. Duplicate analyses or detections of a chemical in the same source are not included, ensuring that data from individual sources are included only once.

Reference:

California Department of Health Services, Division of Drinking Water and Environmental Management. *Drinking Water Quality Monitoring Data (1984-2000)*. February 2001

For more information, contact:

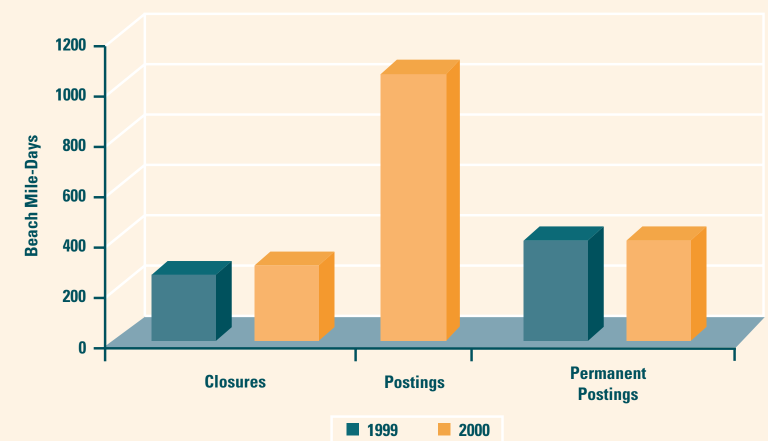
Steven Book
Department of Health Services
P.O. Box 942732
Sacramento, California 94234-7320
(916) 323-6111
sbook@dhs.ca.gov

Coastal Beach Availability - Extent of Beaches Posted or Closed

Beach closures increased 15 percent from 1999 to 2000.

Type I

Level 4
Goal 2



What is this indicator showing?

The figure shows the number of coastal beach-mile days (BMD) posted and closed in 1999 and 2000. BMD is a measure of beach unavailability for swimming recreation each year. Closures increased 15 percent from 1999 to 2000. For 1999, new posting standards were implemented during the year; the partial year results are not shown.

Why is this indicator important?

Beaches, or more precisely the ocean waters adjacent to the beach, must be safe for swimming and other recreational use. When certain bacteria are present in sufficient concentrations, they may pose a health hazard for swimming. County health officers close or post beaches when certain kinds of bacteria are found in the water at levels that are considered a problem. These indicator bacteria imply the potential presence of microscopic disease-causing organisms originating from human and animal wastes. The total annual Beach Mile-Day (BMD) is a measurement of the magnitude of all ocean beach postings and closures for a year. BMD is the total number of miles of beaches posted or closed multiplied by the corresponding number of days of each beach posting or closure incident. Permanent postings are accounted for separately as they are in effect the entire year, often without monitoring.

What factors influence this indicator?

Beginning in 1999, AB 411 (Chapter 765, Statutes of 1997) required that local health officers conduct weekly bacterial testing (total coliform, fecal coliform, and enterococci bacteria) between April 1 and October 31, of waters adjacent to public beaches that have more than 50,000 visitors annually and are near storm drains that flow in the summer. If any one of these indicator organisms exceeds a standard the County health officer is required to post warning signs at the beach and to make a determination whether to close that beach in the case of extended exceedances. Closures are most commonly the result of sewage spills.

Much attention has been given to the number of beach closures and warnings (postings), especially along the southern California coast. California coastal communities have active monitoring programs conducted primarily by county health agencies and municipal waste treatment facilities. Water samples are collected in the surf zone to determine if recreational waters are contaminated with indicator bacteria (total coliform, fecal coliform, and enterococci bacteria). Studies have been conducted that correlate the levels of indicator bacteria with incidence of illness. If tests using indicator bacteria show levels above state standards, the beach will be posted with warning signs or closure notices to notify the public of the potential human health risk. The beach is reopened when further sampling confirms that bacteria levels meet state standards.

A beach closure occurs as a result of a sewage spill or repeated incidences of exceedances of bacteriological standards from an unknown source. A closure is a notice to the public that the water is unsafe for contact and that there is a high risk of getting ill from swimming in the water.

The posting of a warning sign means that at least one bacterial standard has been exceeded, but there is no known source of human sewage. The posting of a warning sign alerts the public of a possible risk of illness associated with water contact.

Many areas near storm drains, which often flow year-round, violate at least one of the bacterial standards on an ongoing basis. By convention, in southern California, all flowing storm drains are posted permanently. In many of these areas, sampling of water quality conditions is not conducted. Consequently, these permanent postings are separately accounted for in this indicator. Future reductions in permanent postings BMDs will occur with the implementation of measures such as the diversion of dry weather flows in storm drains.

Technical Considerations:

Data Characteristics

BMD is a measurement of beach availability. It is derived by multiplying two parameters that describe the magnitude of beach closures/postings in California: (1) number of miles affected; and (2) number of days during which ocean recreational waters are not available for swimming.

Strengths and Limitations of the Data

Annual BMD postings and closures are a useful measure for comparing the health of beaches from year-to-year. Other potential indicators such as number of incidents, the physical dimensions of each incident, or the number of days of postings or closures fall short of characterizing the full magnitude of beaches closures and postings in one measure.

Comparisons with beach monitoring data from the past is difficult. Before AB 411 became law, County health officers had discretion to sample waters and to post or close any beach that violated total coliform standards. Under the new regulations, health officers are required to sample and to post warnings whenever any one of the bacterial standards is violated. While health officers have the discretion for beach closures, they achieved consistency of closure actions throughout 1999 and 2000. Implementation of AB411 did not occur during the full calendar year of 1999. As such, drawing trends from 1999 to 2000 is appropriate for beach closures (which AB411 did not affect), but not for postings.

For the most part, this indicator reflects conditions of coastal beaches in southern California. The total availability of these waters is approximately 100,000 BMDs (no postings or closures for the year).

For more information on the SWRCB's Clean Beaches Initiative, please visit www.swrcb.ca.gov/beach/index.html.

Reference:

2000 California 305(b) Report on Water Quality. State Water Resources Control Board.

For more information, contact:

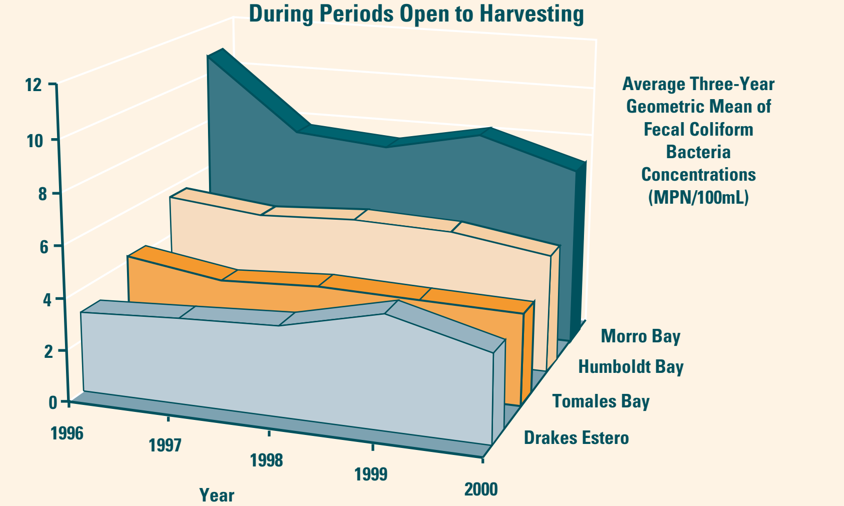
State Water Resources Control Board
Office of Statewide Initiatives
P.O. Box 944212
Sacramento, California 94244
(916) 341-5271

Type I

Level 4
Goal 2

Bacterial Concentrations in Commercial Shellfish Growing Waters

Water quality at four commercial shellfish growing areas continues to meet standards for bacterial contamination.



What is the indicator showing?

The fecal coliform bacteria concentrations in approved commercial shellfish growing waters during periods open to harvesting continue to be maintained within the regulatory standard of 14 MPN (most probable number)/100 mL.

Bacterial contamination of shellfish has been a concern for consumers of shellfish. Monitoring of shellfish growing waters assures that the risk of a disease outbreak from the consumption of commercially harvested shellfish is minimized.

The fecal coliform concentration indicator is actually the arithmetic mean of the three-year geometric means for the individual shellfish growers within the specific water body that supports commercial shellfish growing. The arithmetic mean of the three-year geometric means serves as a measure for the overall bacteriological quality of the shellfish growing areas in the specific water body. As an average, the measure can be used for general comparisons with the regulatory standard.

What factors influence this indicator?

Fecal coliform bacteria concentrations are monitored in approved commercial shellfish growing waters during periods open to harvesting. Low fecal coliform bacteria concentrations in approved commercial shellfish growing waters during periods open to harvesting imply a corresponding low bacteriological contamination of the meats of harvested shellfish. The indicator shows there have been no exceedances of the regulatory standard for fecal coliform bacteria in the approved shellfish growing waters during the period of 1996 through 2000.

Water quality tends to be worse during periods when shellfish are not harvested and monitoring is not conducted. As a result, water quality, as reflected by fecal coliform counts during these periods, would not be represented by these data.

The regulatory standard for approved shellfish growing waters during periods open to harvesting is based on the geometric mean of fecal coliform bacteria of monthly samples taken over the most recent three-year period. When this regulatory standard is exceeded, further restrictions to harvesting are placed on approved commercial shellfish growers. Ongoing evaluations of three-year geometric means relative to the regulatory standard are conducted to assess the effectiveness of these restrictions on improving the bacteriological qualities of approved shellfish growing waters during periods open to harvesting. As a result, ongoing changes in these restrictions will tend to lower the fecal coliform bacteria concentrations and the three-year geometric mean. This measure has been collected consistently for several years to meet regulatory requirements and represents trends in the quality of the water used for growing shellfish.

Technical Considerations:

Data Characteristics

The regulatory standard of a fecal coliform bacteria concentration of 14 MPN per/100 milliliter (mL) was established through a U.S. Public Health Service review of epidemiological investigations of shellfish-caused disease outbreaks which occurred from 1914 to 1925, a period when disease outbreaks attributable to shellfish were more prevalent. MPN refers to the Most Probable Number, as determined by a specific assay. The review indicated that typhoid fever and other enteric diseases would not ordinarily be attributed to shellfish harvested from water in which the estimated fecal coliform concentration was lower than 14 MPN/100 mL, provided the shellfish growing areas were not subject to direct contamination with small amounts of fresh sewage which would not be revealed by bacteriological examination.

Approved commercial shellfish growers are required to collect monthly water quality samples using appropriate sampling methodologies in the growing areas during periods open to harvesting. These samples are sent to appropriately certified laboratories and are analyzed for fecal coliform bacteria concentrations using appropriately approved methods. Data collection is conducted using methodologies that yield data that are clearly defined, verifiable, and reproducible. As a result, the indicator will reflect any significant trends in the approved commercial shellfish growing waters' ability to meet regulatory standards. Shellfish harvested from these beds include: Pacific oysters, Kumamoto oysters, Eastern oysters, European oysters, Manila clams, Bay mussels and Mediterranean mussels.

Strengths and Limitations of the Data

Approved commercial shellfish growers collect monthly water quality samples only during periods open to harvesting. As a result, the monthly data do not represent water quality in approved commercial shellfish growing waters during periods closed to harvesting. Harvesting in these areas is generally closed during periods of likely adverse pollution events, such as heavy rainfall, sewage spills, and other potentially significant releases of contaminants to the shellfish growing waters.

Finally, fecal coliform bacteria concentrations are used only as a general indicator of contamination by potential pathogenic microorganisms. The fecal coliform bacteria concentration results may not provide sufficient indication of contamination by other pathogenic microorganisms, such as viruses and other pathogenic bacteria.

References:

Triennial Sanitary Survey Update Reports (for commercial shellfish growing areas in California)

For more information, contact:

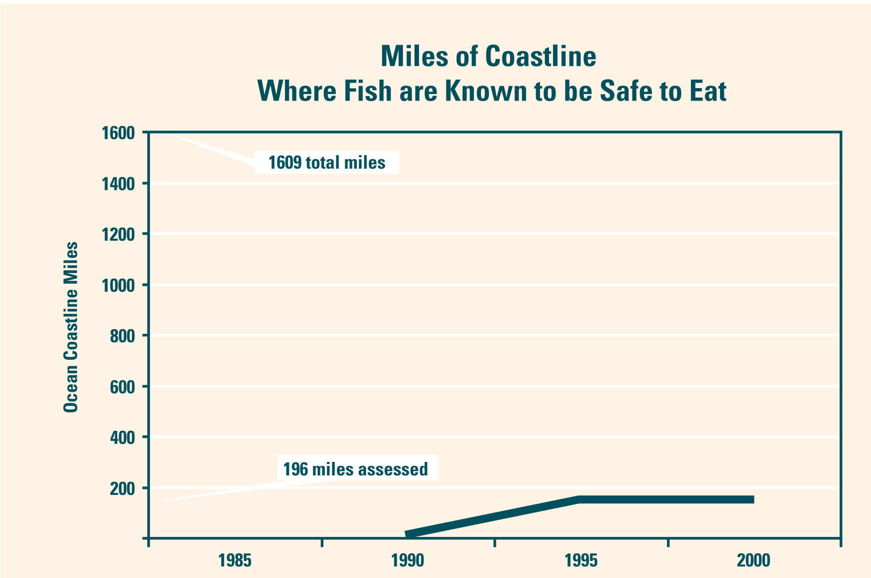
Department of Health Services
Drinking Water and Environmental Management Division
P.O. Box 942732
Sacramento, California 94234-7320
(916) 327-5590

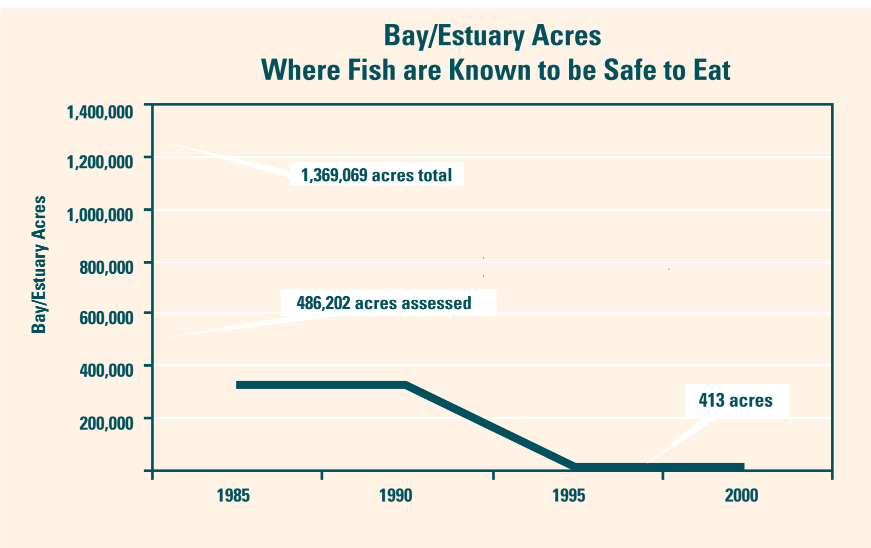
Fish Consumption Advisories - Coastal Waters

The extent of coastal waters where fish can be safely eaten is being maintained in the coastal areas and is decreasing for bay/estuary areas.

Type I

Level 5
Goal 2





What is the indicator showing?

The ocean waters assessed to determine the safety of consuming fish are a small fraction of all waters where fishing occurs. The data indicate that, for total miles of coastline assessed, areas available for safe fish consumption are being maintained. In contrast, data for bays and estuaries indicate that areas available for safe fish consumption have decreased.

Why is this indicator important?

This indicator shows the extent of coastal waters (coastline and bay/estuary) where it is safe for the general population to consume the fish they catch. The Office of Environmental Health Hazard Assessment's (OEHHA) Coastal Fish Contamination Program provides ongoing monitoring and assessment of the potential human health effects from consuming sport fish caught in coastal waters.

Recreational fishing is an important beneficial use of water. Water bodies used for recreational fishing must be "fishable" (i.e., people should be able to consume the fish they catch without appreciable health risk). OEHHA issues fish consumption advisories, providing recommendations on fish consumption limits, where there is a potential human health risk related to sport fish consumption. This indicator uses OEHHA's determination that the general public can eat at least one meal a week of the sport fish they catch from a water body to identify coastal water bodies where fish are "known" (because they have been tested and health effects evaluated) to be safe to eat. Water bodies for which there is insufficient fish monitoring data available to determine whether there is a human health risk are not included in this indicator. As the area of coastal waters for which it is known that fish are safe to eat increases, fewer people fishing in coastal waters will be exposed to potential human health risks due to the accumulation of chemicals in the sport fish they catch.

This indicator shows that the extent of ocean miles where it has been demonstrated that it is safe for the general public to eat fish once a week increased from 1990 to 1995 and remained the same in 2000. In contrast, this indicator shows that the extent of bay and estuary acres where it is safe for the general public to eat fish once a week decreased in this time period.

What factors influence this indicator?

Past studies and ongoing monitoring of chemicals in fish have been used by OEHHA to perform risk assessments and issue public advisories to stop or reduce consumption of sport fish where the chemical levels in fish might adversely affect human health when eaten for a lifetime. This indicator is highly dependent on the extent of monitoring and the frequency of reassessment. Assessments have been conducted in a limited number of waters. Thus, care should be exercised in drawing conclusions from this indicator.

Trends in the past 15 years reflect, in part, changes in monitoring and assessment. The Coastal Fish Contamination Program, which began in 1999, is providing monitoring data for assessing all fishable coastal areas. This program is generating a baseline against which future changes can be measured.

Technical Considerations:

Data Characteristics

Fish caught from water bodies used for recreational fishing are analyzed for appropriate chemical contaminants following guidelines that will ensure that the chemical concentration data can be used for human health risk assessment. Most fish consumption advisories in California are due to mercury, PCBs, or chlorinated pesticide contamination in fish. OEHHA establishes guidelines and sampling plans in conjunction with the State Water Resources Control Board, the Regional Water Quality Control Boards and the California

Department of Fish and Game. Typically, the Department of Fish and Game collects and analyzes fish, although other agencies and laboratories may also do so. Data on water body collection site, water body size (in miles or acres), fish species, number of fish collected, fish length and weight, lipids, and chemical concentrations in tissue are needed as part of the risk assessment. Chemical concentrations are expressed as wet weight concentrations and are used to determine whether there is a potential health risk from fish consumption and how many meals it is safe to consume. Up-to-date toxicologic information is also needed for human health assessments. Water bodies are only assessed when sufficient data of good quality are available.

Strengths and Limitations of the Data

The strength of this indicator is that the basic measure (the safe consumption of frequently caught sport fish species) is easy to understand, is based on scientific data subject to quality control, and integrates several more complex concepts (e.g., chemical levels and risk assessment). Fish data also have the advantage of integrating chemical exposure over space and time and from different media (water and sediment) into a single indicator of water quality.

The primary limitation of this indicator is that much of the State's coastal water bodies have not been assessed. Hence, this indicator is not based on a large database and is not currently representative of the entire state. OEHHA's assessments cover 196 miles of coastline (of the 1,609 total miles) and 486,202 acres of bays and estuaries (of the 1,369,069 total acres). To date, 12 advisories have been issued for coastal waters. The relatively new Coastal Fish Contamination Program will greatly improve the extent of coastal areas monitored and assessed for potential human health effects from eating California sport fish. The program uses a five-year monitoring and assessment cycle. Thus, it will require additional time to complete all coastal areas. Initially the program will focus on identifying and assessing priority water bodies. Therefore, early results may show little increase in safe areas, but will assess a greater area. This is likely to change as all areas are monitored and assessed.

New developments in toxicological research can result in fish consumption advisory changes for a particular water body, regardless of changes in the chemical concentration in water or fish, and are not necessarily indicative of a change in water quality. Additionally, this indicator may not show small changes in chemical concentrations because not all changes are significant enough to warrant different consumption advice. Finally, on a statewide basis, this indicator may be less sensitive to changes in water bodies with a small area, than large water bodies.

Fish Consumption Advisories for California Coastal Waters

Water Body	Contaminant	Fish With Restricted Consumption
San Francisco Bay and Delta	Mercury, PCBs and other chemicals	All fish except salmon, anchovies, herring, and smelt
Point Dume/Malibu off shore	PCBs and DDT	White Croaker
Malibu Pier	PCBs and DDT	Queen Fish
Short Bank	PCBs and DDT	White Croaker
Redondo Pier	PCBs and DDT	Corbina
Point Vicente, Palos Verde-Northwest	PCBs and DDT	White Croaker
White' s Point	PCBs and DDT	White Croaker, Sculpin, Rockfishes, Kelp Bass
Los Angeles/Long Beach Harbor (esp. Cabrillo Pier)	PCBs and DDT	White Croaker, Queenfish, Black Croaker, Surfperches
Los Angeles/Long Beach Breakwater (Ocean Side)	PCBs and DDT	White Croaker, Queenfish, Black Croaker Surfperches
Belmont Pier, Pier J	PCBs and DDT	Surfperches
Horseshoe Kelp	PCBs and DDT	White Croaker, Sculpin
Newport Pier	PCBs and DDT	Corbina

References:

State Water Resources Control Board. *2000 California 305(b) Report on Water Quality.*

Office of Environmental Health Hazard Assessment. *California Fish Consumption Advisories.* Posted at: www.oehha.ca.gov/fish/general/99fish.html

For more information, contact:

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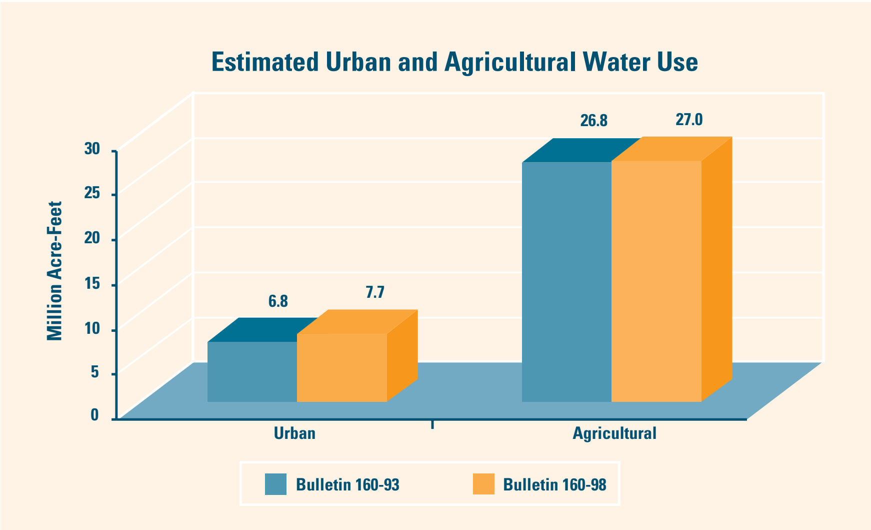
Pesticide and Environmental Toxicology Section
P.O. Box 4010
Sacramento, California 95812-4010
(916) 323-4763

Statewide Water Use And Per Capita Consumption

Urban water uses are growing at a faster rate than agricultural uses.



Type I

Level 3
Goal 6

What is the indicator showing?

This indicator shows that while urban uses are increasing as the population grows, agricultural uses are leveling off due to land conversions and other causes.

Why is this indicator important?

This indicator reflects trends in the interplay between the statewide urban and agricultural water uses. These and a third sector (environmental water use) largely consume all of the fresh water accounted for by the Department of Water Resources (DWR) in its periodic California Water Plan Updates. Total urban water use is increasing as urban populations are increasing. Agricultural water use is leveling off largely as the result of conversion of agricultural land for urban expansion. (DWR long-term forecasts are for a decline in agricultural water use.)

What factors influence this indicator?

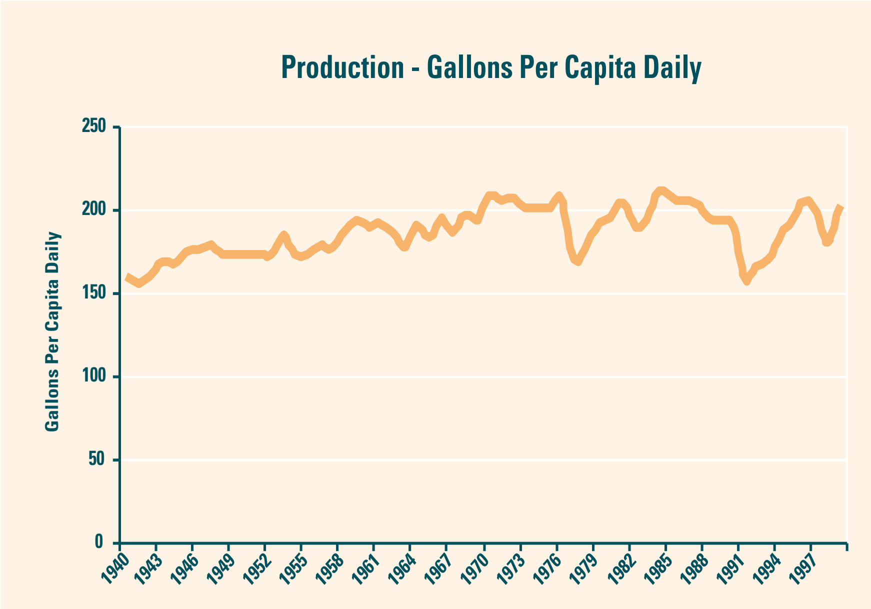
This indicator is drawn from the 1990 and 1995 base case scenarios developed for the 1993 and 1998 California Water Plan (CWP) Updates. These updates are intended to enable informed decisions for water supply and use management at local, regional, statewide, and national levels of government. Published as the Bulletin 160 series, the CWP Update is on a five-year issuance cycle. For each CWP Update, DWR with input from a Public Advisory Committee addresses key factors that affect water demands, such as population growth, climate change, changes in land uses, socioeconomic conditions and markets for California products. These factors may change with each update. In addition, each update incorporates new methods in data management and evaluation.

The 1957 CWP and its seven subsequent updates (Bulletin 160 series) include water budget information for both existing and future needs. Water supplies and uses are not equally distributed across the state. Generally, the northern Sierras generate abundant surface runoff, but major agricultural and urban uses are in the Great Central Valley and coastal regions. Costs to transfer water between regions are generally borne by the users. Regional self-sufficiency is an emerging concern. Each CWP Update discusses both statewide and regional water budgets.

Urban water use includes residential, commercial, industrial, and institutional uses of water. Each of these categories can be examined at a greater level of detail, such as interior and exterior residential use. Many factors may influence rates of urban per capita water use, such as water pricing by the retail water purveyor, seasonal weather, and the implementation of water conservation measures.

Agricultural water use is estimated by multiplying water use requirements for different crop types by their corresponding irrigated acreage, and summing the totals. Agricultural water use may be influenced by crop cultural practices, seasonal rainfall, water pricing, and water use efficiency measures, among other factors.

The figure that follows shows statewide historical per capita urban water production. (Per capita production is the water provided by urban suppliers, divided by population. Urban water production is not the same as total urban water use. Total use includes self-produced supplies, water for recreation and energy production uses, and losses from major conveyance facilities.) After the severe but brief 1976-77 drought, statewide urban per capita water production rates returned to pre-drought levels within three to four years. During the longer 1987-92 drought, urban per capita water production rates declined by about
19 percent on the average statewide. (Most requirements for water-conserving plumbing fixtures did not take effect until after the 1987-92 drought.) The Department's data show increases in per capita water production following the drought, due to removal of mandatory water rationing and other short-term restrictions. When viewed at a statewide level, the data show a strong response to hydrologic conditions.



Technical Considerations:

Data Characteristics

To the extent data are available, the CWP Update addresses water deliveries by source (see California's water supplies with existing facilities and programs in the Background Indicators section) as well as water uses by sector. Historical water information is developed at detailed local levels, then aggregated regionally and statewide. Some of the basic data sets incorporated into this indicator include historical urban water production by urban water purveyors, surveys of irrigated agricultural acreage and other land uses, and groundwater usage. Sampling techniques and direct surveys are among the basic data development methods used to gather information on state water uses and deliveries. Certain data sets are unique, and developed directly for the CWP Update, while others are "imported" from other agencies, such as population information from the Department of Finance and the U.S. Census Bureau.

The two most recent CWP Updates have also included dry year and normal hydrology year scenarios for the base and forecast water balances. Recent amendments to the enabling statutes in the California Water Code have prescribed the water supply and demand management parameters to be analyzed by the CWP Update, starting with the 2003 issue.

References:

California Department of Water Resources
California Water Plan (Bulletin 3)
California Water Plan Update (Bulletin 160 Series)
www.waterplan.water.ca.gov

For more information, contact:

Department of Water Resources,
Statewide Water Planning Branch
P.O. Box 942836
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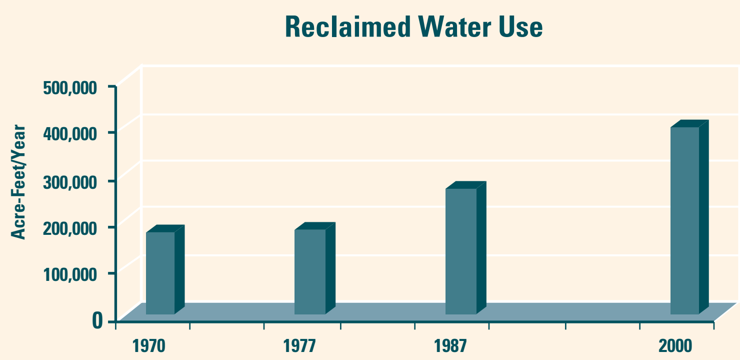
Type I

Level2
Goal 6

What is the indicator showing?
Wastewater recycled at municipal wastewater treatment plants increased by 50 percent in 13 years. In 2000, the amount of recycled water was equivalent to the annual water supply needs of over 1,600,000 people.

Water Use Efficiency - Recycling Municipal Wastewater

The amount of municipal wastewater recycled annually is increasing.



Why is this indicator important?

Municipal wastewater, collected and treated, can be directly used for a variety of beneficial uses, depending on the quality of the effluent achieved and the various water demands. These uses include agricultural and landscape irrigation, industrial cooling water, recreational, wildlife habitat and other uses. This indicator shows the amount of municipal wastewater reclaimed and directly put to beneficial use. Reclaimed water, also called recycled water, means water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur. Increases in the amount of water recycled increase the state's overall water supply capacity.

What factors influence this indicator?

For 2000, the estimated total amount of treated municipal wastewater that is being recycled is 402,000 acre-feet per year. This represents a 50 percent increase from a survey conducted 13 years ago by the State Water Resources Control Board (1987). The wastewater is produced by 234 treatment plants and is being reused at approximately 4,840 sites. Statewide, roughly 80 percent of wastewater reclamation is done by 20 percent of the treatment plants involved in reclamation. Additional details are available in the survey (see References), also posted at www.swrcb.ca.gov.

The amount of wastewater reclaimed in 2000 approximates the annual water supply needs of approximately 1,600,000 people (based on 1995 estimates by the Department of Water Resources of 229 gallons per capita per day in 1995). This is equivalent to the combined water storage capacity of Castaic Reservoir and Big Bear Lake in southern California. It is also equivalent to the storage capacity of four reservoirs the size of Los Vaqueros in the San Francisco Bay region.

The state has a goal of reclaiming one million acre-feet/year of wastewater by 2010.

Technical Considerations:

Data Characteristics

The State Water Resources Control Board conducted a comprehensive survey of water reclamation in California for the year 1987. It was accomplished by a mass mailing of a detailed questionnaire to all known agencies producing reclaimed water for reuse. The year 2000 survey used a new approach. It is part of an on-going survey in which the data for agencies will be updated at differing frequencies depending on the amount of reuse and the anticipated rate of changes expected. Thus, each year, many of the large reclamation projects will be resurveyed and new projects will be added. The remaining projects will be resurveyed at longer intervals, perhaps up to five years. In this way, the survey at any given time will provide a reasonable estimate of the total reuse occurring. Because of this approach, many of the smaller projects and some larger projects are still based on 1987 data.

Strengths and Limitations of the Data

Much of the updated information was obtained by use of a questionnaire. However, additional data sources include annual monitoring reports submitted by the reclaiming entities to the Regional Water Quality Control Boards, annual reports submitted on completed water reclamation projects funded by the State Water Resources Control Board, telephone interviews, and review of waste discharge or reclamation requirements. Another important source is the Annual Status Report on Reclaimed Water Use, which is issued by the County Sanitation Districts of Los Angeles County and provides reuse information at ten District plants.

A substantial amount of unplanned reuse occurs throughout California, either through diversions from streams downstream from wastewater discharges or from percolation of treated wastewater in stream beds. This indicator does not include unplanned (and often difficult to quantify) reuses. For example, the percolation of effluent through rapid infiltration, as in ponds, intended primarily as a method of wastewater treatment and disposal, is not considered planned reuse. Planned reuse is the deliberate direct or indirect use of reclaimed water without relinquishing control over the water during its delivery.

A significant component of groundwater supply for some communities involves the indirect reuse of effluent percolated in stream beds. Indirect reuse is the use of reclaimed water indirectly after it has passed through a natural body of water after discharge from a wastewater treatment plant. These indirect uses are not included in this indicator.

Beyond the scope of this indicator are other activities, which in effect reclaim wastewaters, or polluted waters. These include the downstream reuse of agricultural drainage water and the remediation of polluted groundwaters.

References:

California State Water Resources Control Board, Office of Water Recycling. *California Municipal Wastewater Reclamation Survey.* May 24, 2000

For more information, contact:

State Water Resources Control Board
Office of Water Recycling
P. O. Box 944212
Sacramento, California 94244
(916) 341-5739

Type II

Groundwater Contaminant Plumes - Extent

The extent of groundwater contaminant plumes represents an integrated spatial view of the threat to groundwater resources resulting from various sources of pollution. These specific sources of pollution are discussed in related environmental indicators pertaining to groundwater including Leaking Underground Fuel Tank (LUFT) sites. This indicator will provide a comprehensive measure of the overall effect of contamination on groundwater quality over time. However, at this time, the data for the indicator have not been assembled into a useable format.

Groundwater contaminant plumes result from a variety of sources including leaking landfills, leaking underground storage tanks, and other unauthorized releases of contaminants to groundwater. Characterizing the extent of a groundwater contaminant plume requires knowledge of the site hydrogeology, as well as sufficient site characterization and monitoring data. Changes in the extent of groundwater contaminant plumes, as well as the temporal trends in concentrations of contaminants in groundwater monitoring wells, reflect changes in groundwater quality over time. Once the extent of a groundwater contaminant plume has been characterized, an assessment of the real and/or potential threat to receptors may be evaluated. In addition, tracking changes in the extent of groundwater contaminant plumes over time enables resource managers to assess plume stability and the overall impact to groundwater quality.

The extent of groundwater contaminant plumes is defined in several State Water Resources Control Board (SWRCB) and Regional Water Quality Control Board (RWQCB) programs, such as the Department of Defense (DOD) Program, the Spills, Leaks, Investigations, and Cleanup Program (SLIC) Program, the Land Disposal Program, and the Underground Storage Tank (UST) Program. A majority of the data regarding the spatial extent of groundwater contaminant plumes are collected by responsible parties in response to regulatory requirements and kept in program site files at the various RWQCB offices. Although most of the data are in hard copy format, the San Francisco Bay RWQCB has conducted a successful pilot study to obtain groundwater contaminant plume data in digital format. Spatial data are most effectively displayed and analyzed using a geographic information system, such as the SWRCB's GeoTracker system, geotracker.swrcb.ca.gov/.

For more information, contact:
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Contaminant Release Sites

Type II

The total number of contaminant release sites (not regulated as part of the Underground Storage Tank Program, which is addressed as a separate indicator) indicates an impact to groundwater resources. A subset of this indicator, contaminant release sites located within 1,000 feet of public drinking water sources, measures the relative proportion of these sites that may pose an imminent threat to drinking water supplies. However, at this time, the data have not been assembled into a useable format.

Contaminant release sites may impact groundwater resources and include leaking landfills, contaminant release sites at military facilities; chemicals spilled onto the ground during storage, transport or disposal; percolation of pollutants from illegal dumping of hazardous substances and waste materials; and leakage through the soil from improperly lined waste disposal ponds, sumps, and industrial leach fields. These types of contaminant release sites are regulated by the State Water Resource Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCB) in the Land Disposal, Department of Defense (DOD), and Spills, Leaks, Investigations, and Cleanup (SLIC) Programs. Sites are identified through investigations of contaminated drinking water wells, public complaints, groundwater monitoring and routine environmental sampling, referrals from other agencies, and disclosures from responsible parties.

Leaking landfill site data are discussed in the 1989 SWRCB Solid Waste Assessment Test (SWAT) Report. State and Regional Board staff manage landfill data using the SWRCB's System for Water Information Management (SWIM) database. Currently, the data in SWIM are incomplete and undergoing improvement. In addition, SWRCB is initiating the collection of accurate landfill geographical data using global positioning system (GPS) receivers. There is also an effort to track other contaminant release sites in the Spills, Leaks, Investigations, and Cleanup Program database that includes geographical information. The distance between contaminant release sites and water supply sources will be displayed on the SWRCB's GeoTracker Internet site, as soon as accurate geographical information is obtained. The extent of groundwater plumes associated with these types of contaminant release sites are captured in the "Groundwater Contaminant Plumes" environmental indicator.

References:

State Water Resources Control Board. *Solid Waste Assessment Test (SWAT) Report.* 1989

State Water Resources Control Board. SWIM Database, posted at: oitweb/oit/html/swim.htm

State Water Resources Control Board. GeoTracker System, posted at: geotracker.swrcb.ca.gov/

For more information, contact:

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Type III

Fish Consumption Advisories - Inland Waters

Recreational fishing is an important beneficial use of water. Chemical contaminants in water bodies can accumulate in fish and shellfish to levels that make them unsafe to eat. This indicator is analogous to the "Fish Consumption Advisories - Coastal Waters" but is expressed separately here for inland river and lake areas since there is substantially less information to characterize rivers and lakes than there exists for coastal waters. Furthermore, there is no formal program to monitor rivers and lakes, as there is for coastal areas. The indicator is highly dependent on the extent of monitoring and the frequency of reassessment. Currently, the inland waters assessed to determine the safety of consuming sport caught fish are a very small fraction of all waters where fishing occurs. Nevertheless, the assessed waters show a trend toward an increased area of lakes and rivers where the general public can safely eat at least one meal a week of the sport fish they catch from a water body.

Assessments conducted by the Office of Environmental Health Hazard Assessment (OEHHA) cover 202 miles of perennial river (out of 64,438 total miles) and 289,717 acres of lake (out of 2,086,230 total acres, including saline lakes). To date, 14 advisories have been issued for inland waters. Data indicate that the amount of lake acres where it is demonstrated that fish can be safely consumed once a week increased from 1985 to 2000 (from about 5400 acres to about 70000 acres, respectively). The extent of river miles where a meal a week can be safely eaten also increased during this time (an increase from 0 to 50 miles, respectively, from 1985 to 2000). Sport fishers may be concerned, despite the positive trend, because so little river and lake area in the state has been assessed. A program similar to OEHHA's Coastal Fish Contamination Program is needed to collect the data necessary to make this a useful indicator. Without a dedicated program, this indicator can only be updated when special or one-time studies generate adequate data for assessment of rivers or lakes.

Fish Consumption Advisories for California Inland Waters

Water Body Name	Contaminant	Fish With Restricted Consumption
Lake Herman	Mercury	Largemouth Bass
Guadalupe Reservoir	Mercury	All fish
Calero Reservoir	Mercury	All fish
Almaden Reservoir	Mercury	All fish
Guadalupe River and associated percolation ponds	Mercury	All fish
Guadalupe Creek and associated percolation ponds	Mercury	All fish
Alamitos Creek and associated percolation ponds	Mercury	All fish
Lake Nacimiento	Mercury	Largemouth Bass
Harbor Park Lake (Machado Lake)	Chlordane and DDT	Goldfish, Carp
Clear Lake	Mercury	Largemouth Bass, White Catfish, Channel Catfish, Brown Bullhead, Blackfish, Crappie and Hitch
Lake Berryessa	Mercury	Largemouth Bass, Smallmouth Bass, White Catfish, Channel Catfish, Rainbow Trout
Grasslands Area	Selenium	All fish
Salton Sea	Selenium	Croaker, Orangemouth Corvina, Sargo, and Tilapia
Lake Pillsbury	Mercury	All fish

References:

State Water Resources Control Board. *2000 California 305(b) Report on Water Quality.*

Office of Environmental Health Hazard Assessment, California Fish Consumption Advisories, posted at: www.oehha.ca.gov/fish/general/99fish.html

For more information, contact:

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Pesticide and Environmental Toxicology Section
P.O. Box 4010
Sacramento, California 95812-4010
(916) 323-4763
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Type III

Groundwater Supply Reliability

This indicator would provide an estimate of the amount of groundwater available for long-term extraction, in acre-feet per year, without causing adverse effects. The indicator would be used to help determine whether or not our current groundwater supplies are sufficient in quantity to meet future demands. It is important to identify the amount of groundwater available to meet future demands in order to avoid unacceptable extraction amounts and to plan future water management strategies for meeting water-related beneficial uses in California.

The groundwater available is determined by Basin Management Objectives (BMOs) for each basin and sub-basin in the state. These BMOs would identify threshold values at which groundwater extraction would be terminated. Threshold values would be identified for groundwater level in the aquifer, water quality conditions, and land surface subsidence. The BMOs may be implemented by groundwater management plans or ordinances, and also include other environmental and institutional factors.

Main data sources are Department of Water Resources monitoring wells, U.S. Geological Survey information, and local agency monitoring programs. Available information includes: a) groundwater levels in wells, seasonal data collected at a minimum in the fall and spring, b) groundwater basin geology, collected from existing maps, published reports, and well completion reports, and c) basin water budgets, data from extraction records, water demands by land use, known recharge, and estimated recharge.

The indicator cannot be presented because there are over 500 basins and sub-basins in California which vary in the amount of data available and adequacy to present an indicator. In addition, BMO objectives have not been identified for many basins.

For more information, contact:
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